## SPEC

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To C. F. Hiskey

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FROM Bernard Barash

IN RE: Bloomington Experiments

Left Chicago on Sunday, December 12, for Bloomington, Indiana, where I was to work in conjunction with Dr. Mitchell. Carried along approximately 1200 grams of D<sub>2</sub>O.

On Monday, December 13, some necessary equipment arrived from Chicago, was unpacked, and made ready for use. A large dry box had been constructed for purposes of D<sub>2</sub>O handling and it was set up for operation.

On Tuesday, experiments were begun. Several slurries were made up using analyzed, micronized UO<sub>2</sub> and light water. This latter was employed for two reasons. First, it served as a good means of perfecting the technique of handling liquid and slurries in the dry box; secondly, Dr. Mitchell was interested in determining the results for light water and comparing them with those of previously used UO<sub>2</sub> mixtures with sugar and carbon and those to be obtained with D<sub>2</sub>O.

Barring poor results, four light slurries and four heavy slurries were to be run with light water; four light slurries and four heavy slurries were to be run with heavy water.

A series of light slurries was first run off. In these the proportion in grams of UO2:H20:CdSO4 was 1.0:2.62:0:147, respectively. Two slurries were run off on Tuesday and one more on Wednesday morning. These first three failed to check and in endeavoring to determine where the error lay it was decided that the monitors may not have been placed in the same positions on the cylinders for each of the runs. A definite position was then chosen on each cylinder and four more runs were made on Wednesday afternoon and Thursday. These checked well and also with the third one.

Four heavy slurries were run and calculated on Friday and Saturday. The proportion in grams of UO2:H20:CdSO4 in these was 1.0:0.549:0.147, respectively. These gave good results.

In all of these slurries fresh, distilled water was used for each preparation. In the heavy water slurries the D<sub>2</sub>O of each slurry was to be derived from the D<sub>2</sub>O decanted from the last slurry after irradiation. Two runs were, therefore, made on Sunday to determine whether the results were altered by the slight amount of UO<sub>2</sub> remaining suspended in the decanted water. The water decanted from the fourth heavy water slurry was used for the first of these and the water decanted from this one was used for the second. In each case a little additional H<sub>2</sub>O had to be added to make up for the small amount

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retained by the  $\rm UO_2$  mud. Both of these runs checked closely with those done with fresh water, thus justifying the use of decanted  $\rm D_2O$  in experiments to follow.

On Monday experiments using D<sub>2</sub>O were begun. A stock solution containing 850 grams of D<sub>2</sub>O and 20.83 grams CdSO<sub>4</sub> was prepared, for the proportion of D<sub>2</sub>O to CdSO<sub>4</sub> in grams in all of the D<sub>2</sub>O slurries was to be 1.0: .0245. To insure complete dehydration of the CdSO<sub>4</sub>, it was baked at 115°C. 108°C is the temperature of transition to the anhydrous form. Before use each day the dry box was evacuated with a vacuum pump while oxygen passed through drierite was passed in at the rate of 10-12 liters per minute. This "flushing" operation was continued for fifteen minutes and during all operations involving the dry box oxygen was run into it at the rate of 10 liters per minute.

Four runs employing light slurry were made on Monday and Tuesday A.M. The proportion in grams of UO2:D20:CdSO4 was 1.0:2.62: .0245. The results on these checked very closely, and the four heavy slurries were made up and run on Tuesday afternoon and Wednesday morning. The proportion in grams of UO2:D20:CdSO4 in these was 1.0:0.549:0.0245 respectively. The results of these runs are now being calculated and a preliminary statement has been made to the effect that they check.

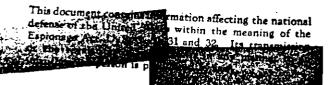
In all cylinders an air space was allowed to permit for better agitation and maintenance of slurry homogeneity during rotation. For the light slurries this air space was about 3% of the volume of each cylinder. For the heavy slurries it was about 11% of the volume of each cylinder. The fact that the results check is a good indication that little settling occurred during irradiation as the cylinders were being rotated. This was observed, too, when the cylinder contents were poured off after each run. Very little UO2 had collected on the walls.

My personal job in the experiments was to prepare the slurries in proper proportions, put them into the boxes, screw the boxes closed, suggest the necessary length of time of rotation before irradiation to insure homogeneity, pour off the contents after irradiation, centrifuge the mixture and decant the liquid after centrifugation, do all handling of D<sub>2</sub>O, and take all samples. The separation and purification was done by a member of Dr. Mitchell's staff. I assisted also in reading the counters and tabulating the figures.

As much of the wet  $\rm UO_2$  was saved as possible to allow for maximum recovery of the  $\rm D_2O$ . Also approximately 350 grams of unused  $\rm D_2O$  was returned together with the  $\rm D_2O$  -  $\rm CdSO_4$  -  $\rm UO_2$  decanted mixture.

Samples taken and the numbers assigned to them are as

follows:







- l. Sample of starting D<sub>2</sub>O
- 2. Sample of D<sub>2</sub>O from middle box after fourth run heavy slurry
- 3. Sample of D<sub>2</sub>O from middle box after first run light slurry
- 4. Sample of D<sub>2</sub>O from middle box after fourth run light slurry
- 5. Sample of D20 from middle box after first run heavy slurry
- 6. Sample of D<sub>2</sub>O from large cylinder after fourth run heavy slurry
- 7. Sample of D<sub>2</sub>O from middle box after second run heavy slurry
- 8. Sample of D<sub>2</sub>O from middle box after third run heavy slurry

Returned to Chicago on Thursday, December 23rd.

